
PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Bull Trout Assessment - Willamette/Mckenzie

BPA project number: 9405300

Contract renewal date (mm/yyyy): 12/1999 ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Oregon Department of Fish and Wildlife

Business acronym (if appropriate) ODFW

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses
10.5A.1

FWS/NMFS Biological Opinion Number(s) which this project addresses

Other planning document references

McKenzie Subbasin Fish Management Plan, Resident Trout Section, Adopted by the Oregon Fish and Wildlife Commission, April 1997 (ODFW 1997)
McKenzie Watershed Council Water Quality and Fish and Wildlife Action Plan, Adopted by consensus by the McKenzie Watershed Council, Jan. 11, 1996

Short description

Monitor distribution, population trends, and habitat use of bull trout populations in the Upper Willamette Basin. Continue to implement the Rehabilitation Plan for bull trout in Middle Fork Willamette (ODFW 1997).

Target species

Bull trout (*Salvelinus confluentus*)

Section 2. Sorting and evaluation

Subbasin

Willamette (McKenzie River, Middle Fork Willamette River)

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
<input type="checkbox"/> Anadromous fish <input checked="" type="checkbox"/> Resident fish <input type="checkbox"/> Wildlife	<input checked="" type="checkbox"/> Multi-year (milestone-based evaluation) <input type="checkbox"/> Watershed project evaluation	<input checked="" type="checkbox"/> Watershed councils/model watersheds <input checked="" type="checkbox"/> Information dissemination <input type="checkbox"/> Operation & maintenance <input type="checkbox"/> New construction <input checked="" type="checkbox"/> Research & monitoring <input checked="" type="checkbox"/> Implementation & management <input type="checkbox"/> Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description
20550	Willamette Basin Mitigation Program Umbrella
9206800	Willamette Basin Mitigation Program, Phase III, Wildlife
9107800	Burlington Bottoms Wildlife Mitigation Project
9705906	Securing Mitigation Sites in Oregon - McKenzie River Islands
9705907	Securing Mitigation Sites in Oregon - EE Wilson WMA Additions

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9206800	McKenzie Watershed Council Coordination	Coordinates McKenzie Watershed Council administration, project planning, implementation and monitoring among multiple stakeholders/landowners. The proposed project would be guided by the ongoing McKenzie Watershed Council framework.
9206800	Assess Mckenzie Watershed Habitat And Prioritize Projects	Assesses McKenzie Watershed habitat by synthesizing recent watershed analyses and gathering

		data to address information gaps. The project will provide a basin-wide context for bull trout habitat protection, restoration and monitoring strategies.
9405400	Bull trout genetics, habitat needs, life history in Central and NE Oregon	Both are Columbia River Basin bull trout studies. 9405300 targets Willamette Subbasin populations 9405400 targets subbasins in Eastern Oregon.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1996	? Over 100 miles of stream have been surveyed for presence of bull trout. Young of the year bull trout have only been found in known spawning tributaries.	
1998	? Redd surveys conducted in Anderson and Olallie creeks and the mainstem McKenzie show an increasing trend in adult bull trout abundance.	
1998	? With a downstream migrant trap, we monitored of timing and numbers of juveniles moving downstream in Anderson Creek. Data indicates good spawning success; however, habitat for young of the year bull trout may be limited.	
1998	? Monitoring of radio transmitters implanted in bull trout has allowed us to describe seasonal movements and habitat use in mainstem McKenzie, South Fork McKenzie, and Cougar Reservoir.	
1997	? Information collected on this project has allowed ODFW to complete a risk assessment, rehabilitation plan and monitoring program for bull trout in the Middle Fork Willamette River.	

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Determine distribution of bull trout in the Middle Fork Willamette and McKenzie river basins.	a	Conduct surveys of potential spawning locations of bull trout in the Middle Fork Willamette and tributaries above Hills Creek Reservoir.
		b	Conduct surveys of potential spawning locations in the McKenzie River and tributaries above Trail Bridge Dam; tributaries of the mainstem below Trail Bridge Dam and in the South Fork McKenzie above Cougar Reservoir.
		c	Determine juvenile bull trout rearing areas by locating fish with snorkeling and electrofishing techniques in habitat identified as suitable for bull trout.
		d	Locate adult bull trout rearing and spawning areas in the mainstem and South Fork McKenzie rivers by radio tagging up to 10 adult fish.
2	Determine population size of bull trout in the McKenzie and Middle Fork Willamette basins.	a	Estimate the number of bull trout in the Middle Fork subbasin using calibrated snorkel observations and the results of spawning surveys conducted in Task 1.1. Snorkeling will be conducted at night to enhance the effectiveness of the survey.
		b	Estimate the number of juvenile bull trout migrating from Anderson Creek using a rotary screw downstream migrant trap and calculating trap efficiency.
		c	Estimate the number of bull trout residing in Anderson Creek by calibrated night snorkel counts. We will calculate a density estimate based on the calibrated counts and extrapolate for the total area below the barrier falls in Anderson Creek.
		d	Conduct bi-weekly counts of known spawning areas in Anderson Creek,

			Olallie Creek and mainstem McKenzie from September 1-October 15.
		e	Continue using snorkeling gear to count adult bull trout in pools of the mainstem and South Fork McKenzie rivers as an index to pre-spawning bull trout abundance and distribution.
		f	Utilize estimates of the number of spawning bull trout collected in Task 2.4. to obtain trend data on bull trout populations.
3	Determine life history characteristics of bull trout in the Middle Fork and McKenzie river basins.	a	Summarize information collected in Objectives 1 and 2 to identify habitat characteristics of adult and juvenile bull trout rearing areas and spawning locations.
		b	Identify the amount of habitat in the McKenzie and Middle Fork Willamette subbasins similar to habitat currently or historically colonized by bull trout in those basins.
		c	Calculate the potential size of the Middle Fork Willamette and McKenzie river bull trout populations by extrapolating from the average density of bull trout found in Task 3.1 and the amount of habitat determined in Task 3.2.
4	Implement the Rehabilitation Plan for the bull trout population in the Middle Fork Willamette River (ODFW 1997).	a	Transfer young of the year bull trout captured in the rotary screw trap from Anderson Creek to the Middle Fork Willamette River. Fry will be transported from February-April 1998 through 2002.
		b	Conduct snorkel surveys to monitor survival, distribution and growth of bull trout from the release site downstream approximately one kilometer. Calculate growth rates using length at release data and visual estimates of size from snorkel surveys.
		c	Identify habitat characteristics of

			juvenile rearing areas including water temperature and flow, stream gradient, substrate size, distance to cover, and habitat complexity (e.g. amount of large wood, pools).
5	Determine the effectiveness of restrictive angling regulations for maintaining bull trout populations in the Willamette Basin.	a	Estimate catch of bull trout by anglers in Cougar and Trail Bridge reservoirs and calculate potential mortality.
6	Provide information acquired about bull trout to landowners and land management agencies within the McKenzie and Middle Fork Willamette basins and to other regional entities.	a	Compile data collected in this study and relate to habitat surveys completed by USFS and ODFW.
		b	Provide quarterly and annual reports of operations and interim findings to BPA and other interested parties.
		c	Publish the results and recommendations in a refereed journal or equivalent. Additional informational and technical presentations will be conducted as requested.
		d	Coordinate and participate in bi-annual meetings of the Upper Willamette Bull Trout Working Group to coordinate field activities and exchange information.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	2/1994	09/2002			25.00%
2	6/1996	11/2002			15.00%
3	3/1998	11/2002			30.00%
4	6/1994	11/2002			15.00%
5	6/1994	08/2002			5.00%
6	8/1994	11/2002			10.00%
				Total	100.00%

Schedule constraints

No constraints are foreseen

Completion date
2002

Section 5. Budget

FY99 project budget (BPA obligated): \$46,008

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	Experimental Biology Aide, 15 FTE months	%41	24,081
Fringe benefits		%20	12,041
Supplies, materials, non-expendable property	Gloves, wading boots, waders, flashlights, 2 dry suits, 5 radio tags and office supplies	%6	3,300
Operations & maintenance		%0	
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%0	
NEPA costs		%0	
Construction-related support		%0	
PIT tags	# of tags:	%0	
Travel	Mileage, vehicle rental and per diem	%8	4,560
Indirect costs	Overhead	%26	15,258
Subcontractor		%0	
Other		%0	
TOTAL BPA FY2000 BUDGET REQUEST			\$59,240

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount (\$)
ODFW	Personnel	%23	24,997
US Forest Service	Personnel	%24	26,175
		%0	
		%0	
Total project cost (including BPA portion)			\$110,412

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	\$62,575	\$65,703	\$0	\$0

Section 6. References

Watershed?	Reference
<input type="checkbox"/>	Bellerud, B.L., S. Gunkel, A.R. Hemmingsen, D.V. Buchanan and P.J. Howell. 1997. Bull trout life history, genetics, habitat needs, and limiting factors in central and northeast Oregon. U.S. Dept. of Energy, Bonneville Power Administration, Portland, OR.
<input type="checkbox"/>	Buchanan, D.V. and S.V. Gregory. 1997. Development of water temperature standards to protect and restore habitat for bull trout and other cold water species in Oregon. Proceedings of the friends of the bull trout conference. Calgary, Alberta.
<input type="checkbox"/>	Buchanan, D.V., M.L. Hanson and R.M. Hooton. 1997. Status of Oregon's bull trout. Oregon Department of Fish and Wildlife. Portland, Oregon.
<input type="checkbox"/>	Cavender, T.M. 1978. Taxonomy and distribution of the bull trout, <i>Salvelinus confluentus</i> (Suckley) from the American Northwest. California Fish and Game 64(3): 139-174.
<input type="checkbox"/>	Goetz, F. 1989. Biology of the bull trout, <i>Salvelinus confluentus</i> , a literature review. USDA, Willamette National Forest, Eugene, Oregon.
<input type="checkbox"/>	Houslet, B.S. and M.D. Riehle. 1997. Trends in juvenile bull trout abundance and habitat use in relation to temperature in tributaries to the Metolius River, Oregon. U.S. Forest Service, Sisters Ranger District.
<input type="checkbox"/>	Howell, P. J. and D.V. Buchanan, editors. 1992. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis, Oregon.
<input type="checkbox"/>	Kostow, K. 1995. Biennial report on the status of wild fish in Oregon. Oregon Department of Fish and Wildlife, Portland, Oregon.
<input type="checkbox"/>	Leary, R.F., F.W. Allendorf and S.H. Forbes. 1993. Conservation genetics of bull trout in Columbia and Klamath River Drainages. Conservation Biology 4, 856-865.
<input type="checkbox"/>	Oregon Department of Fish and Wildlife. 1994. Bull trout population study in the Middle Fork Willamette and McKenzie River Drainage Basins. ODFW, Springfield.
<input type="checkbox"/>	Oregon Department of Fish and Wildlife. 1995. Bull trout (<i>Salvelinus confluentus</i>) population and habitat surveys in the Middle Fork Willamette and McKenzie River Systems. ODFW, Springfield.
<input type="checkbox"/>	Oregon Department of Fish and Wildlife. 1996. Bull trout (<i>Salvelinus confluentus</i>) population and habitat surveys in the Middle Fork Willamette and McKenzie River Systems. ODFW, Springfield.
<input type="checkbox"/>	Oregon Department of Fish and Wildlife. 1997a. Bull trout (<i>Salvelinus confluentus</i>) population and habitat surveys in the McKenzie River System.

	ODFW, Springfield.
<input type="checkbox"/>	Oregon Department of Fish and Wildlife. 1997b. Bull trout (<i>Salvelinus confluentus</i>) rehabilitation and habitat surveys in the Middle Fork Willamette System. ODFW, Springfield.
<input type="checkbox"/>	Oregon Department of Fish and Wildlife. 1997c. McKenzie Subbasin Fish Management Plan, Trout Management Sections. ODFW, Springfield
<input type="checkbox"/>	Oregon Department of Fish and Wildlife. 1997d. Rehabilitation of bull trout in the upper Middle Fork Willamette River: Actions, risk analysis, and monitoring plan. ODFW, Springfield.
<input type="checkbox"/>	Oregon Department of Fish and Wildlife. 1998. Bull Trout (<i>Salvelinus confluentus</i>) Population and Habitat Surveys in the Middle Fork Willamette and McKenzie River Systems. ODFW, Springfield.
<input checked="" type="checkbox"/>	Ratliff, D. E. and P. J. Howell. 1992. The status of bull trout populations in Oregon. Pages 10-17 in P. J. Howell and D.V. Buchanan, editors. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chap. of AFS, Corvallis
<input type="checkbox"/>	Rigdon Ranger District. 1996. Upper Middle Fork of the Willamette watershed analysis. Willamette National Forest, Eugene, Oregon.
<input type="checkbox"/>	Spruell, P. and F.W. Allendorf. 1997. Nuclear DNA analysis of Oregon bull trout. Oregon Department of Fish and Wildlife Report 97/5. Portland Oregon.

PART II - NARRATIVE

Section 7. Abstract

The goal of this project is to attain population health and long term sustainability of bull trout and their habitat in the Upper Willamette Basin by the acquisition of quantifiable population information and the rehabilitation of depressed bull trout stocks. This project is being conducted under Section 9.3G (1) of the Northwest Power Planning Council's Resident Fish and Wildlife amendments. The project will describe the range of bull trout in the Upper Willamette Drainage Basin system by snorkeling or electrofishing surveys on tributaries. We will monitor the population size using downstream migrant traps and snorkel counts, conduct spawning surveys and estimate the number of spawning bull trout, monitor the movements of radio-tagged bull trout to determine habitat use and locate spawning areas, and evaluate the effectiveness of habitat improvement projects for bull trout within the basin. A small percentage of bull trout captured in the downstream migrant trap will be transferred to unoccupied habitat in the Middle Fork Willamette River and monitored for survival and growth. This project will provide timely information about bull trout populations to resource managers in the McKenzie and Middle Fork Willamette watersheds. Information concerning distribution, population trends, and habitat use of bull trout populations will aid in rebuilding depressed populations and in mitigation of hydroelectric/flood control projects. This project

proposes to continue through FY 2002, and, with associated habitat improvement projects and management decisions, bull trout populations are expected to slowly increase over the project period. The results of this project are monitored and evaluated annually by the Upper Willamette Bull Trout Working Group; whose members include all agencies with management responsibility for bull trout in the Willamette Basin.

Section 8. Project description

a. Technical and/or scientific background

Prior to 1978, Dolly Varden (*Salvelinus malma*) were classified into an anadromous and interior form. Cavender (1978) classified the interior form as a distinct species, *Salvelinus confluentus*, the bull trout. Bull trout are large char weighing up to 18 kg and growing to over one meter in length (Goetz 1989). They are distinguished by a broad flat head, large downward curving maxillaries that extend beyond the eye, a well developed fleshy knob and a notch in the lower terminus of the snout, and light colored spots normally smaller than the pupil of the eye (Cavender 1978). Bull trout are considered to be valuable indicators of ecosystem status and health because they require cold, spring-fed water, relatively undisturbed habitat (usually associated with old growth forests), and unrestricted interbasin migrations (Ratliff and Howell 1992). On June 10, 1998, U.S. Fish and Wildlife Service (USFWS) listed the Columbia River bull trout population segment (including the McKenzie populations) as Threatened under the federal Endangered Species Act.

History of project area and bull trout populations

In Oregon, bull trout were once found in the Clackamas, Santiam, McKenzie, and Middle Fork Willamette subbasins (Goetz 1989). However, bull trout have declined throughout their range because of overharvest, past land management practices, and removal of fish by chemical application in some areas. Because of their piscivorous nature, bull trout were blamed for declines in populations of more “desirable” species such as Pacific salmon (*Oncorhynchus* spp.), rainbow trout (*O. mykiss*), and cutthroat trout (*O. clarki*). Bull trout have now been extirpated from all areas west of the Cascades except the McKenzie subbasin and possibly the Middle Fork Willamette subbasin. The McKenzie subbasin contains the only verifiable populations of bull trout in Western Oregon (ODFW 1997c).

McKenzie Subbasin Project Area: The McKenzie River subbasin portion of the project area includes all the tributaries and channels of the McKenzie River up to Tamolitch Falls, including the South Fork McKenzie River and tributaries. Historically, bull trout in the McKenzie River subbasin may have been a contiguous population from the Willamette River to Tamolitch Falls or two populations with some overlapping distributions (Leary et al. 1993). If two populations did exist, one spawned in the upper reaches of the South Fork McKenzie and one in the upper reaches of the mainstem McKenzie. Construction of Cougar Dam cut off the South Fork population from the mainstem in 1963, and at nearly the same time, Trail Bridge Dam divided the mainstem

McKenzie population. The McKenzie and Willamette populations likely existed as parts of a Willamette River metapopulation, in which the two populations occasionally mixed. Three McKenzie populations are currently identified: 1) the mainstem McKenzie and tributaries up to Trail Bridge Dam, including the South Fork McKenzie below Cougar Dam, 2) the South Fork McKenzie and tributaries from Cougar Dam upstream, and 3) the upper McKenzie River and tributaries from Trail Bridge Dam to Tamolitch Falls, including Sweetwater Creek.

Middle Fork Willamette Subbasin Project Area: Historically, bull trout were reported in the Middle Fork Willamette subbasin, including the Middle Fork and North Fork of the Middle Fork Willamette rivers as well as Salt, Swift, and Staley creeks (Goetz 1989). Fish from the McKenzie population may have ranged occasionally into the mainstem Willamette and spawned with bull trout from the Middle Fork Willamette River (MFW). However, relatively warm water temperatures in the mainstem Willamette and the bull trout's strong homing instinct may have precluded common genetic exchange between the populations (Buchanan and Gregory 1997, Houslet and Riehle 1997).

In addition to overharvest in the MFW, several specific factors can be identified in the decline of bull trout. Extensive timber management and road building practices damaged bull trout spawning and rearing habitat and precluded access to suitable habitat. Construction of Dexter, Lookout Point, and Hills Creek dams modified stream temperatures and restricted migrations to and from spawning grounds. Loss of salmon above the dams eliminated one of the bull trout's largest food sources. Rotenone poisoning to remove undesired fish above Hills Creek Dam in 1960 killed bull trout in MFW tributaries. The last reliable observation of bull trout in the MFW subbasin was above Hills Creek reservoir in 1990.

Potential bull trout habitat remains in spring-fed portions of the MFW and tributaries above Hills Creek Reservoir (Rigdon Ranger District 1996). However, despite occasional angler reports, repeated electrofishing and snorkel surveys of the MFW and tributaries have not detected bull trout presence. Therefore, the Upper Willamette Bull Trout Working Group believes that Middle Fork Willamette bull trout will not continue to persist in the subbasin without rehabilitation efforts.

Project History: This project was initiated in 1994 and five field seasons of collecting data have been completed. Previous work in the upper Willamette Subbasin has been reported in annual reports by ODFW (1994, 1995, 1996, 1997a, 1997b, 1998). See Section d, Project history, for details of findings. This project has generated major commitments of time and funding from the U.S. Forest Service, Eugene Water and Electric Board, ODFW, local and national angling groups, and others. Monitoring information is being used by the McKenzie Watershed Council, U.S. Forest Service, ODFW and the USFWS in land management and regulatory decisions. Knowledge gained from this project will aid ODFW and land management agencies in mitigating the impacts of hydroelectric development and land management practices on bull trout in the Upper Willamette Basin. This knowledge will be useful for planning and lessening the impacts of major projects including the U.S. Army Corps of Engineers proposal to retrofit a temperature control tower to the penstock at Cougar Reservoir.

b. Rationale and significance to Regional Programs

This study will further the goals of FWP by providing scientific information that will help protect and restore weak stocks of native bull trout. These stocks have been threatened or changed by migration barriers which limit spawning and rearing habitats and which may limit the prey base along with other important limiting factors such as genetic and random risks, over harvest, non-native species introductions and habitat loss. Like salmon and steelhead, bull trout have been impacted by hydroelectric development in the Willamette Subbasin and dams have isolated small bull trout populations and prevented genetic exchange. Work conducted in this project in cooperation with *Bull trout life history, genetics, habitat needs, and limiting factors in central and northeast Oregon* (Bellerud et al. 1997) has increased the potential for bull trout recovery in Oregon. The work of Spruell and Allendorf (1997) suggest that maintaining the genetic diversity of bull trout requires the continued existence of many populations throughout the Columbia Basin. Recent restrictive angling regulations prohibit harvest of bull trout in all of Oregon except for limited populations in the Deschutes Basin (Buchanan et al, 1997). Fishery managers need this increased understanding of movement patterns, habitat needs, genetic characteristics, and the effects of exotic fish to protect and restore Oregon's bull trout.

The information collected in this study is key to the implementation of the McKenzie Subbasin Fish Management Plan, Resident Trout Section, (ODFW 1997c), the McKenzie Watershed Council Water Quality and Fish and Wildlife Action Plan (McKenzie Watershed Council 1996) and the Wild Fish Management Policy of ODFW (Kostow, K. 1995). The McKenzie Watershed Council (MWC) is submitting project proposals for funding watershed habitat assessment, prioritization and acquisition. Bull trout information collected in this project will aid MWC in acquisition decisions. In addition, this study has interacted with a large number of habitat improvement projects in the upper Willamette Basin in cooperation with the USFS, Oregon Department of Transportation (ODOT), Eugene Water and Electric Board (EWEB), BLM, Weyerhaeuser Co., Guistina Land and Timber, Oregon Council Federation of Fly Fishers and Trout Unlimited (See Section 8). These projects would likely have been less successful without the information provided by this study.

This study has also provided the framework for the rehabilitation of the bull trout population in the Middle Fork Willamette River. BPA, ODFW, USFS and others in the Upper Willamette Bull Trout Working Group, have invested a major commitment of time and money to collect information needed to implement this rehabilitation program. This project will guide implementation through the year 2002, when the success of the project will be ascertained and applicability to other systems can be evaluated. This is a very important advance in bull trout management in the Willamette Basin because random re-establishment of natural populations has been eliminated by hydroelectric and flood control projects. With review from the Upper Willamette Bull Trout Working Group, we have completed a risk assessment; rehabilitation plan and monitoring program. Implementation of this effort will require the funding included in this proposal. The results of the rehabilitation program will have region-wide implications.

c. Relationships to other projects

The information collected in this study is key to the implementation of the McKenzie Subbasin Fish Management Plan, Resident Trout Section, (ODFW 1997c), the McKenzie Watershed Council Water Quality and Fish and Wildlife Action Plan (McKenzie Watershed Council 1996) and the Wild Fish Management Policy of ODFW (Kostow, K. 1995). In addition, this study has interacted with a large number of other projects in the upper Willamette Basin:

Project title/funding entity	Relationships
Sweetwater Creek culvert replacement/USFS, Oregon Department of Transportation (ODOT), Eugene Water and Electric Board (EWEB)	Cooperators
Olallie Creek culvert replacement/USFS, ODOT, EWEB, Oregon Council Federation of Fly Fishers	Cooperators
Sweetwater Creek bull trout transplant/USFS, EWEB	Cooperators
Deer Creek large woody debris placement/USFS, EWEB	Cooperators
Leaburg Lake large woody debris placement/EWEB	Cooperator
Horse Creek instream projects/USFS	Cooperator
Anderson Creek study reach/USFS	Cooperator
Buck Side Channel enhancement projects/USFS	Cooperator
Paradise Side Channel hazard tree replacement/USFS	Cooperator
South Fork McKenzie wood replacement project/USFS	Cooperator
Upper South Fork McKenzie aquatic restoration/USFS	Cooperator
Middle Fork Willamette aquatic restoration/USFS	Cooperator
Bring Back the Natives cooperative research and habitat program/Trout Unlimited, USFS, EWEB, BLM, Weyerhaeuser Co., Guistina Land and Timber	Cooperator

These projects would likely have been less successful without the information provided by this study.

This project has been a collaborative effort between ODFW and USFS Blue River, McKenzie and Rigdon ranger districts. We have all have provided major investments of time and resources. In addition, this study has had the cooperation and resources of the Oregon Department of Transportation (ODOT), Eugene Water and Electric Board (EWEB), BLM, Weyerhaeuser Co., Guistina Land and Timber, Oregon Council Federation of Fly Fishers and Trout Unlimited.

d. Project history (for ongoing projects)

This project initiated in 1994 and we have completed five field seasons of data collection and analysis. Project costs have been: FY98 \$61,964, FY97 \$41,611, FY96 \$58,151, FY95 \$58,949, FY94 \$37,579. Our FY99 Budget is \$54,396. Reporting documents submitted include quarterly reports and annual reports for FY94, FY95, FY96, and FY 97 (ODFW 1994, 1995, 1996, 1997a and 1997b, 1998).

Major findings reported to date include:

- Bull trout have not been located in the Middle Fork Willamette River basin.
- Over 100 miles of stream have been surveyed for presence of bull trout. Young of the year bull trout have only been found in known spawning tributaries. Juvenile bull trout, ages 3+ and older have been found in tributaries without known spawning locations. It appears these sub-adults may be nomadic foragers.
- Redd surveys conducted in Anderson and Olallie creeks and the mainstem McKenzie show an increasing trend in adult bull trout abundance.
- Redd surveys conducted in Roaring River, and South Fork McKenzie indicate few bull trout are surviving to spawn.
- Pools surveyed in the index area of McKenzie River show peak counts in late July and August. We have not observed a positive correlation between index pool counts of bull trout and spawning ground counts
- Pools surveyed in the index area of South Fork McKenzie River show peak counts in June decreasing through the summer. Evidence of illegal angler harvest has been found.
- With a downstream migrant trap, we monitored timing and numbers of juveniles moving downstream in Anderson Creek. Data indicates good spawning success; however, habitat for young of the year bull trout may be limited. The 1996 flood appears to have had a negative effect on emergent bull trout.
- Monitoring of radio transmitters implanted in bull trout has allowed us to describe seasonal movements and habitat use in mainstem McKenzie, South Fork McKenzie, and Cougar Reservoir. We have found the range of bull trout in the McKenzie River extends at least 15 miles further downstream than previously known.
- Information collected during this project has allowed ODFW to complete a risk assessment, rehabilitation plan and monitoring program for bull trout in the Middle Fork Willamette River. The implementation phase of the rehabilitation program is included in this proposal. This effort would not have been accomplished without Columbia River Basin Fish and Wildlife Program.
- The project has generated major commitments of time and funding from the U.S. Forest Service, Eugene Water and Electric Board, local and national angling organizations, and others.
- Monitoring information is being used by the USFWS, McKenzie Watershed Council, U.S. Forest Service, and Oregon Department of Fish and Wildlife in land management and regulatory decisions.

e. Proposal objectives

Goal: Attain population health and long term sustainability of bull trout and their habitat in the Upper Willamette Basin by the acquisition of quantifiable population information and the rehabilitation of depressed bull trout stocks.

Objective 1. Determine distribution of bull trout in the Middle Fork Willamette and McKenzie river basins.

This will allow assessment and tracking of bull trout populations and guide efforts towards habitat protection, enhancement, and restoration. Distribution data is necessary for the protection of existing critical habitat and any restoration efforts that may be undertaken. Bull trout distribution within a basin may vary widely depending on life history, life stage and season. The overall null hypothesis to be tested is “H₀: There is no significant difference between observed bull trout distribution and a random distribution”. Distribution maps from this objective have been made available to management biologists and posted on the Streamnet world wide web site (Buchanan et al., 1997). A component of this objective examines variability associated with using spawning surveys, provides baseline data for designing surveys and evaluates their effectiveness as a monitoring tool. Without effective monitoring of populations it is not possible to protect and restore Oregon bull trout populations. Hypotheses to be tested include:

“H₀: There is no significant difference between years in the distribution of redds within a stream”.

“H₀: There is no significant differences between redd counts by different surveyors”.

“H₀: There is no significant difference between years in spawning timing”.

“H₀: There is no significant difference in the variation of distribution of redds within a stream”.

Objective 2. Determine population size of bull trout in the McKenzie and Middle Fork Willamette basins.

The number of bull trout in the McKenzie and Middle Fork Willamette basins is not known. Information collected in this study should allow us to enumerate populations, determine trends and relate population size to genetic significance. Hypotheses to be tested are:

“H₀: There is no significant difference between years in observed bull trout numbers in the McKenzie Basin”.

“H₀: Bull trout are no longer present in the Middle Fork Willamette River”.

Objective 3. Determine life history characteristics of bull trout in the Middle Fork and McKenzie river basins.

This objective involves the gathering of basic life history data to allow tracking and management of migratory bull trout populations. One of the major components of this goal examines the role of non-migrant fish in otherwise migrant bull trout populations. Knowledge of life history characteristics, such as spawning and migration behavior, is the basis of scientific fisheries management. The null hypothesis associated with this objective is: “H₀: Bull trout populations are limited by habitat quantity and quality in the Upper Willamette Basin”.

Objective 4. Implement the Rehabilitation Plan for the bull trout population in the Middle Fork Willamette River (ODFW 1997).

This study has provided the framework for the rehabilitation of the bull trout population in the Middle Fork Willamette River. This is a very important advance in bull trout management in the Willamette Basin because random re-establishments of natural populations has been eliminated by hydroelectric and flood control projects. With review from the Upper Willamette Bull Trout Working Group, we have completed a risk assessment, rehabilitation plan and monitoring program. Continued implementation of this effort will require the funding included in this proposal. The results of the rehabilitation program will have region-wide implications. The null hypothesis associated with this objective is: “H₀: A population of bull trout can not be re-established by transfers of young of the year bull trout”.

Objective 5. Determine the effectiveness of restrictive angling regulations for maintaining bull trout populations in the Willamette Basin.

Recent restrictive angling regulations prohibit harvest of bull trout in all of Oregon except for limited populations in the Deschutes Basin (Buchanan et al, 1997). In the McKenzie and Middle Fork Willamette basins, angling regulations require the release of non-fincipped fish in most bull trout waters. The null hypothesis associated with this objective is: “H₀: Bull trout populations are not protected from mortality by angling regulations”.

Objective 6. Provide information acquired about bull trout to landowners and land management agencies within the McKenzie and Middle Fork Willamette basins and to other regional entities.

This project will provide timely information about bull trout populations to resource managers in the McKenzie and Middle Fork Willamette watersheds. Information concerning distribution, population trends, and habitat use of bull trout populations will aid in rebuilding depressed populations and in mitigation of hydroelectric/flood control projects. Quarterly and annual reports have been and will be written and distributed to members of the Upper Willamette Bull Trout Working Group and other interested parties.

f. Methods

The methods used in the following tasks are detailed in annual project reports (ODFW 1994, 1995, 1996, 1997a, 1997b, 1998).

Objective 1

Task 1.1. Conduct surveys of potential spawning locations of bull trout in the Middle Fork Willamette and tributaries above Hills Creek Reservoir. Survey locations will be determined from historical ODFW survey data and the distribution of cold

water, appropriate gravel substrate and gradient described in recent habitat surveys conducted by USFS and ODFW.

Activity 1.1.1. Determine suitable habitat from habitat surveys conducted by USFS and ODFW during 1990-1998.

Activity 1.1.2. Maintain informational posters about bull trout in the Middle Fork Willamette and McKenzie basins. These posters provide anglers with key bull trout identification characteristics and places to report sightings of bull trout.

Activity 1.1.3. Conduct snorkel and electrofishing surveys during July through September. Surveyors will record data on stream morphology, key habitat components, species composition and location (location will be determined by topographic maps and GPS).

Activity 1.1.4. Conduct spawning surveys during September and October.

Activity 1.1.5. Enter data into GIS compatible database.

Task 1.2. Conduct surveys of potential spawning locations in the McKenzie River and tributaries above Trail Bridge Dam; tributaries of the mainstem below Trail Bridge Dam and in the South Fork McKenzie above Cougar Reservoir. Surveys will be conducted in cooperation with the USFS from September 1-October 15. Potential spawning locations will be identified by the distribution of cold water, appropriate gravel substrate and stream gradient described in habitat surveys conducted by USFS and ODFW.

Task 1.3. Determine juvenile bull trout rearing areas by locating fish with snorkeling and electrofishing techniques in habitat identified as suitable for bull trout. Criteria for suitable habitat will include stream segments with appropriate water temperatures, stream gradient and flow, and prey resources identified from habitat surveys conducted by USFS and ODFW. Suitable habitat will also be identified from spawning surveys conducted in Tasks 1.1 and 1.2, and from reports of bull trout caught by anglers.

Task 1.4. Locate adult bull trout rearing and spawning areas in the mainstem and South Fork McKenzie rivers by radio tagging up to 10 adult fish during the fall and winter and tracking their movements, at least bi-weekly, through the migration and spawning period of the following year.

Activity 1.4.1. Surgically implant radio tags in up to 10 bull trout

Activity 1.4.2. Identify spawning and rearing areas by tracking radio tagged fish.

Activity 1.4.3. Identify habitat characteristics of spawning and rearing areas.

Objective 2

Task 2.1. Estimate the number of bull trout in the Middle Fork subbasin using calibrated snorkel observations and the results of spawning surveys conducted in Task 1.1. Snorkeling will be conducted at night to enhance the effectiveness of the survey.

Task 2.2. Estimate the number of juvenile bull trout migrating from Anderson Creek using a rotary screw downstream migrant trap and calculating trap efficiency. The migrant trap will be operated approximately 4 d/wk from February through May and at least 4d/mo the remainder of the year.

Activity 2.2.1. Operate a rotary screw fish trap in Anderson Creek.

Activity 2.2.2. Determine timing of migration of juvenile bull trout from Anderson Creek.

Activity 2.2.3. Determine the sampling efficiency of the downstream migrant trap.

Activity 2.2.4. Expand daily catches to account for days not fished and trapping efficiency.

Task 2.3. Estimate the number of bull trout residing in Anderson Creek by calibrated night snorkel counts. We will calculate a density estimate based on the calibrated counts and extrapolate for the total area below the barrier falls in Anderson Creek.

Task 2.4. Conduct bi-weekly counts of known spawning areas in Anderson Creek, Olallie Creek and mainstem McKenzie from September 1-October 15. The cumulative total of new redds will constitute the redd count for the spawning season and will be compared to previous counts as an index to population size.

Task 2.5. Continue using snorkeling gear to count adult bull trout in pools of the mainstem and South Fork McKenzie rivers as an index to pre-spawning bull trout abundance and distribution.

Activity 2.5.1. Conduct biweekly counts of adult bull trout in the index reaches of the mainstem and South Fork McKenzie rivers.

Task 2.6. Utilize estimates of the number of spawning bull trout collected in Task 2.4. to obtain trend data on bull trout populations.

Objective 3

Task 3.1. Summarize information collected in Objectives 1 and 2 to identify habitat characteristics of adult and juvenile bull trout rearing areas and spawning locations. Characteristics will include water temperature and flow, substrate type and size, stream gradient and complexity and riparian vegetation.

Task 3.2. Identify the amount of habitat in the McKenzie and Middle Fork Willamette subbasins similar to habitat currently or historically colonized by bull trout in those basins.

Task 3.3. Calculate the potential size of the Middle Fork Willamette and McKenzie river bull trout populations by extrapolating from the average density of bull trout found in Task 3.1 and the amount of habitat determined in Task 3.2.

Objective 4

Task 4.1. Transfer young of the year bull trout captured in the rotary screw trap from Anderson Creek to the Middle Fork Willamette River. Fry will be transported

from February-April 1998 through 2002. The transportation vehicle is a 250-gallon tank with oxygenated water mounted on a trailer.

Task 4.2. Conduct snorkel surveys to monitor survival, distribution and growth of bull trout from the release site downstream approximately one kilometer. Calculate growth rates using length at release data and visual estimates of size from snorkel surveys.

Task 4.3. Identify habitat characteristics of juvenile rearing areas including water temperature and flow, stream gradient, substrate size, distance to cover, and habitat complexity (e.g. amount of large wood, pools).

Objective 5

Task 5.1. Estimate catch of bull trout by anglers in Cougar and Trail Bridge reservoirs and calculate potential mortality. Measure angler catches, the degree of angler compliance and knowledge of the restrictive angling regulations through creel surveys. Estimate mortality using data from bull trout captured for radio tagging by angling.

Activity 5.1.1. Conduct angler interviews and pressure counts.

Activity 5.1.2. Estimate the number of fish caught.

Activity 5.1.3. Estimate the potential for angler-induced hooking mortality using mortality estimates from the literature.

Objective 6

Task 6.1. Compile data collected in this study and relate to habitat surveys completed by USFS and ODFW.

Task 6.2. Provide quarterly and annual reports of operations and interim findings to BPA and other interested parties.

Task 6.3. Publish the results and recommendations in a refereed journal or equivalent. Additional informational and technical presentations will be conducted as requested.

Task 6.4. Coordinate and participate in bi-annual meetings of the Upper Willamette Bull Trout Working Group to coordinate field activities and exchange information.

g. Facilities and equipment

Personnel will be based at the Springfield District Office of the Oregon Department of Fish and Wildlife. They will have access to state owned radio tracking equipment, boats, dry suits, protective clothing, and desk space with computers. In addition, the USFS has purchased a rotary screw downstream migrant trap for this project and FY98 funds from BPA were used to purchase a transportation tank and trailer for juvenile bull trout. Additional equipment needed will include vehicle rental and assorted minor supplies (gloves, wading boots, waders, flashlights and batteries, dry suit repair and office supplies).

h. Budget

Justification for the budget is as follows:

- 1) The largest proportion of the budget (61%) is allocated to provide field personnel (time/fringe benefits) for monitoring bull trout population size and distribution, capturing and transporting juvenile bull trout for the Middle Fork Willamette Rehabilitation Project. One position is needed from the time the downstream migrant trap is put into operation in February until the Annual Report is completed in November (0.83 FTE). The second position will begin at the start of the summer field season and continue through the end on spawning surveys in October (0.42 FTE).
- 2) Six percent of the budget has been allocated for field and office supplies including gloves, wading boots waders, ratio tags (5), water-proof flashlight and batteries, oxygen bottle and refills, miscellaneous office supplies, dry suits (2), and dry suit repair.
- 3) Travel costs include mileage, monthly vehicle rental and per diem for the field staff and makes up about eight percent of the budget. A large amount of travel time and mileage for transporting the staff to remote field locations is a necessity for this project.
- 4) Indirect project costs in the form of overhead constitutes 26 % of the total BPA budget request. The overhead rate is based on the rate projected for FY1999. The overhead rate for FY2000 may not be the same as FY1999 and is anticipated to be slightly below FY1999 rates.

Section 9. Key personnel

Jeffrey S. Ziller, Principle Investigator, 0.17 FTE, no charge to BPA.

Duties will include hiring, training and supervision of seasonal employees, supervision of and participation in field activities. Will also be responsible for the writing and timely distribution of reports as well as presentations to intra-agency and inter-agency meetings.

Mark G. Wade, Project Manager, 0.25 FTE, no charge to BPA

Duties will include training and supervision of seasonal employees, supervision of and participation in field activities. Will also participate in the writing and timely distribution of reports as well as presentations to intra-agency and inter-agency meetings.

Jeffrey S. Ziller

Education:

B.S. Fisheries Science, 1976, Oregon State University.

Current employer: ODFW, Upper Willamette Fish District, Northwest Region, 1990-present.

Current responsibilities: District Fish Biologist responsible for state authorized fish management in the Upper Willamette Basin including the entire watersheds of the McKenzie, Middle Fork Willamette and Coast Fork Willamette rivers.

Previous employment:

Dates	Employer	Responsibilities
1983-1990	ODFW	Assistant District Biologist, Klamath Fish District, Central Region. Responsibilities included management of bull trout populations and Lost River and shortnose suckers in the Klamath River Basin.
1980-1983	ODFW	Assistant Project Leader, Deschutes River Life History Studies and Round Butte Hatchery Evaluation, ODFW Research Section
1978-1980	ODFW	Project Assistant, Deschutes River Life History Studies and Round Butte Hatchery Evaluation, ODFW Research Section
1976-1978	ODFW	Project Assistant, Willamette Summer Steelhead Project, Alsea River Winter Steelhead Project, Catchable Trout Evaluation, ODFW Research Section

Expertise: I have been responsible for bull trout population monitoring and/or management in the Deschutes, Klamath and Upper Willamette Basins for the past 21 years. I have extensive knowledge of bull trout life history characteristics in each of these basins. I also have extensive knowledge of sampling techniques for bull trout and have managed the current bull trout assessment project in the McKenzie and Middle Fork Willamette basins since it's inception in 1994.

Publications and job completions:

Ziller, J.S. 1992. Distribution and relative abundance of bull trout in the Sprague River Subbasin, Oregon. Pages 18-29 in P.J. Howell and D.V. Buchanan, editors. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society. Corvallis, Oregon.

Ziller J.S. 1991. Factors that limit survival and production of largemouth bass in Upper Klamath and Agency lakes, Oregon. Oregon Department of Fish and Wildlife, Information Report 91-6. Portland, Oregon.

Lindsay, R.B, J.S. Ziller and R.K. Schroeder. 1982. An ecological and fish cultural study of Deschutes River salmonids, Annual Progress Report F-88-R-13. Oregon Department of Fish and Wildlife. Portland, Oregon.

Wade, M.G. and J.S. Ziller. 1996. Stock Status Review, Upper Willamette Fish District. Oregon Department of Fish and Wildlife. Springfield, Oregon.

Wade, M.G. and J.S. Ziller. 1997. Stock Status Review, Upper Willamette Fish District. Oregon Department of Fish and Wildlife. Springfield, Oregon.

Mark G. Wade

Education:

B.S. Fisheries Science, 1977, Oregon State University

M.S. Fisheries, 1987, Oregon State University

Thesis - The relative effects of *Ceratomyxa shasta* on crosses of resistant and susceptible stocks of summer steelhead.

Current employer: ODFW, Upper Willamette District, Northwest Region, 1988-present.

Current responsibilities: Assistant District Fish Biologist responsible for state authorized fish management in the Upper Willamette Basin including the entire watersheds of the McKenzie, Middle Fork Willamette and Coast Fork Willamette rivers.

Previous employment:

Dates	Employer	Responsibilities
1979-88	ODFW	Foster Steelhead Restoration Project, ODFW Research Section
1977-79	ODFW	Willamette Summer Steelhead Project, ODFW Research Section

Expertise: I have monitored bull trout populations in the Upper Willamette Basin for the past 10 years. I have extensive knowledge of bull trout life history characteristics in each of these basins. I also have extensive knowledge of sampling techniques for bull trout and have assisted in managing the current bull trout assessment project in the McKenzie and Middle Fork Willamette basins since it's inception in 1994.

Publications and job completions:

Buchanan, D.V., M.G. Wade and D.L. Higley. 1993. Restoration of the native winter steelhead runs on the South Santiam River above Foster Dam, Completion Report, Oregon Department of Fish and Wildlife, Portland, Oregon.

Wade, M.G. and J.S. Ziller. 1994. Stock Status Review, Upper Willamette Fish District. Oregon Department of Fish and Wildlife. Springfield, Oregon.

Wade, M.G. and J.S. Ziller. 1995. Stock Status Review, Upper Willamette Fish District. Oregon Department of Fish and Wildlife. Springfield, Oregon.

Wade, M.G. and J.S. Ziller. 1996. Stock Status Review, Upper Willamette Fish District. Oregon Department of Fish and Wildlife. Springfield, Oregon.

Wade, M.G. and J.S. Ziller. 1997. Stock Status Review, Upper Willamette Fish District. Oregon Department of Fish and Wildlife. Springfield, Oregon.

Section 10. Information/technology transfer

Information acquired about bull trout will be compiled and analyzed including relationships to habitat surveys completed by USFS and ODFW. We will complete and distribute a report of findings to landowners and land management agencies within the

McKenzie and Middle Fork Willamette basins and to other regional entities. Additional informational and technical presentations will be conducted as requested. In addition, we will coordinate and participate in bi-annual meetings of the Upper Willamette Bull Trout Working Group to coordinate field activities and exchange information. We maintain a poster of project accomplishments for presentation to gatherings of interested individuals.

Congratulations!